

University of Bahrain
College of Information Technology
Department of Computer Science
ITCS253 Discrete Structures II
First Semester 2014/2015

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Quiz #3

ID:

NAME:

Section:

(1) Use Iteration method to solve the recurrence relation:

$$a_0 = 1, \quad a_n = a_{n-1} + n$$

$$a_1 = a_0 + 1$$

$$a_2 = a_1 + 2 = a_0 + 1 + 2$$

$$a_3 = a_2 + 3 = a_0 + 1 + 2 + 3$$

$$a_4 = a_3 + 4 = a_0 + 1 + 2 + 3 + 4$$

\vdots

$$\therefore a_n = a_0 + \sum_{i=1}^n i$$

$$= a_0 + \left[\frac{n(n+1)}{2} \right]$$

$$= a_0 + \frac{1}{2} n(n+1)$$

$$= 1 + \frac{1}{2} n(n+1)$$

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- (1) [1 point] What is the closed-form formula for the arithmetic series $\sum_{i=0}^{k+1} i$.

(Answer)

$$\sum_{i=0}^{k+1} i = \frac{(k+1)(k+2)}{2}$$

- (2) [4 points] Use the Iteration Method to solve $a_0 = 1$, $a_n = a_{n-1} + n$, $n \geq 1$.

$$\begin{aligned} a_1 &= a_0 + 1 \\ a_2 &= a_1 + 2 = a_0 + 1 + 2 \\ a_3 &= a_2 + 3 = a_0 + 1 + 2 + 3 \\ a_4 &= a_3 + 4 = a_0 + 1 + 2 + 3 + 4 \\ &\vdots \\ a_n &= a_0 + \sum_{i=1}^n i = a_0 + \frac{n(n+1)}{2} \\ &= a_0 + \frac{1}{2} n(n+1) \\ &= 1 + \frac{1}{2} n(n+1) \end{aligned}$$

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Quiz #5

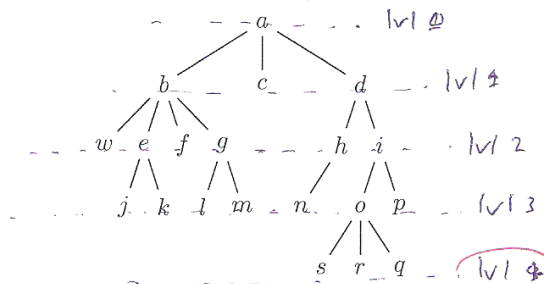
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(1) Consider the following tree.



(a) [1 point] As an m -ary tree. What is the value of m ? Explain.

The m equal the max number of children in tree
therefore m equal 4 because internal vertices has max
no. of children and it's 4.

(b) [1 point] What is the height h of the tree? Explain.

height of tree is 5, and we find it from bottom
how many level in tree. max. path....

(c) [1 point] Is the tree balanced? Why?

Not balanced, because not all leaves leaves in h or $h-1$

(d) [1 point] Is the tree a full m -ary tree? Why?

Not full m -ary tree, because not all internal vertices have
same number of children.

(e) [1 point] Write the degree sequence of the tree.

not
equation?

$$\sum_{i=1}^n \deg(v_i) = 2(n-1)$$

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Quiz #6

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(1) In how many ways can 20 students out of class of 32 be chosen to attend a conference if

(a) [1 point] any one can be chosen ?

Repetition is not allowed and doesn't matter of order 32

$$\times \binom{n+r-1}{r} = \binom{20+32-1}{32} = \binom{51}{32} \quad \left(\begin{matrix} 51 \\ 26 \end{matrix} \right)$$

(b) [1 point] Layla refuses to go ?

~~19~~ Layla

$$\times \binom{20}{19} \quad \times \quad C \left(\begin{matrix} 31 \\ 20 \\ 19 \\ 20 \end{matrix} \right)$$

(c) [1 point] Ahmed insists on going ?

Ahmed

~~19~~

$$C \left(\begin{matrix} 20 \\ 1 \end{matrix} \right) \quad \times$$

(d) [1 point] Ahmed and Mona insist on going ?

Ahmed Mona

$$\times C \left(\begin{matrix} 20 \\ 2 \end{matrix} \right) \quad \times$$

(2) Complete the following identity:

$$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |A \cap C| - |B \cap C| + |A \cap B \cap C|$$

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Quiz #2

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(1) Determine whether the binary operation $*$ is commutative or associative on \mathbb{R} , where $a * b = ab - 3$.

a) [2 points] Commutative.

$$a * b = b * a$$

$$a * b = ab - 3$$

$$b * a = ba - 3$$

$$\therefore a * b = b * a$$

$\therefore *$ is commutative.

b) [2 points] Associative.

$$(a * b) * c = a * (b * c)$$

$$(a * b) * c = (ab - 3) * c$$

$$= abc - 3c - 3$$

$$a * (b * c) = a * (bc - 3)$$

$$= abc - 3a - 3$$

$$\therefore (a * b) * c \neq a * (b * c)$$

$\therefore *$ is not associative.

(2) [1 point] If G is a group, prove that Identity is unique.

Right Identity

$$a * e = a$$

$$ae - 3 = a$$

$$ae = a + 3$$

$$e = \frac{a+3}{a} = \frac{a}{a} + \frac{3}{a} = 1 + \frac{3}{a}$$

Left Identity

$$e * a = a$$

$$ea - 3 = a$$

$$ea = a + 3$$

$$e = \frac{a+3}{a} = \frac{a}{a} + \frac{3}{a} = 1 + \frac{3}{a}$$

\therefore Identity is unique.

$$e * e' = e$$

$$e * e' = e$$